Section 20. Yellow Perch

Introduction

Yellow perch are found throughout most of the freshwater areas in Maryland and have adapted to estuarine habitats within the Chesapeake Bay. Adult yellow perch have developed a “semi-anadromous” lifestyle meaning adults migrate into tidal and non-tidal freshwater to spawn, then move downstream into estuarine waters to complete all other phases of their life cycle. Yellow perch are important to both recreational and commercial fishermen. The late winter/early spring spawning runs offer anglers their first fishing opportunity of the season. The yellow perch commercial fishery is short in duration but regionally important. Since yellow perch congregate in upstream stretches of small spawning streams during a brief period, they are vulnerable to overharvest.

Maryland FMP

The Maryland Tidewater Yellow Perch Fishery Management Plan (FMP), adopted by the State of Maryland in 2002, is the first ecosystem-based fisheries management plan written to assess, protect, restore, and enhance a Chesapeake Bay fish population. This plan was written to serve as a model for the application of ecosystem-based fishery management principles. The ecosystem-based approach examines how changes in fish habitat are impacting population dynamics of the species and the health of the stock. The goal of the yellow perch plan is to protect the reproductive capability of the species in the Maryland portion of the Chesapeake Bay and to over time achieve and optimize a functional and productive fishery.

The plan defines the implementation process of the FMP as iterative, with a tracking system that allows for amendments, revisions, and changes to the plan as the stock changes over time. Regular monitoring and stock assessment enables the plan to include updated actions that serve to restore and protect the yellow perch stock in the best and most representative way possible. A synopsis of the plan can be found on Table 20.1.

Stock Status

Yellow perch stocks declined significantly during the 1970s in Maryland portions of the Chesapeake Bay (MDNR 2002). Regulations in Maryland were implemented in the late 1980s, which increased minimum size limits in the fishery and closed some river systems to harvest. As of 1989, nine watersheds have been closed to commercial fishing of yellow perch including: the Choptank, Magothy, Miles, Nanticoke, Patapsco, Severn, South, West, and Wye Rivers. Six of these river systems are also closed to recreational fishing including: the Magothy, Nanticoke, Patapsco, Severn, South, and West Rivers. Catch-and-release angling is allowed in the closed systems. The six tributaries closed to all yellow perch fishing have been designated as yellow perch spawning areas. The Yellow Perch FMP indicates that current closed areas should be designated yellow perch areas of particular concern so that as resources become available, they can be directed to

improvement of habitat in these areas. Management efforts are directed at tributary-specific yellow perch stocks, due to varied population dynamics between tributaries.

Yellow perch are a semi-anadromous species, migrating upstream into freshwater to spawn and then moving downstream to estuarine waters for other phases of their life cycle. Up and down-migration of yellow perch within tributaries depends on salinity level fluctuation, which varies considerably depending on the tributary and the relative impact of urbanization on the tributary. There could be as many as 25 tributary-specific populations of yellow perch in Maryland, which makes stock assessment logistically difficult. Effective monitoring programs are essential to enable managers to determine current status of stocks in order to make informed stock and habitat management decisions.

The MDNR Multifish Survey monitors yellow perch stocks within Maryland portions of the Chesapeake Bay. Yellow perch stock assessments are conducted using samples from winter bottom trawls in the upper Chesapeake Bay and its eastern tributaries; spring commercial fyke net catches in the upper Chesapeake Bay, the Chester, and Nanticoke Rivers; and experimental fyke nets on the Choptank, Patuxent, and Severn Rivers. Yellow perch sampled in the spring fyke nets are sexed, fork and total length are measured, and otoliths are collected for aging. Age-at-length tables are created from a subset of sampled fish data.

Other monitoring efforts that have contributed to yellow perch stock assessments include: creel surveys on the Chester and Choptank Rivers and the Natural Resources Police Yellow Perch Survey of 2000 and 2001. In addition to stock assessment results, yellow perch juvenile indices provided by the Maryland Juvenile Finfish Survey estimate juvenile abundance and recruitment of some tributary and upper Chesapeake Bay stocks. In river systems that are not sampled, stock status is inferred using model simulations that use population data from nearby systems together with life history characteristics of the species.

Biological reference points were adopted through the Yellow Perch FMP in 2002, including a target fishing mortality rate that if achieved would preserve 35% of the maximum spawning potential and a threshold fishing mortality rate that would preserve 25% of the maximum spawning potential. Targets and thresholds are assessed on a tributary-basis and for the upper Chesapeake Bay according to the most recent stock assessment.

The target F to achieve 35% SPR for the recreational fishery, with a 9” minimum size limit, is 0.31 and the threshold F to achieve 25% SPR is 0.46 (2003 Stock Assessment). Fishing mortality estimates have been difficult to determine in recent years due to prevalence of strong year classes in many systems. Estimations of F in the Choptank River were around 0.25 during 1999-2002 (28% exploitation). Decision rules do not go into effect until the target F is breeched by 20% (0.37) (2003 Stock Assessment). No management actions based on biological reference points were

necessary for 2005 in the Choptank River. Nanticoke sampling was hindered by ice conditions in 2004, and no estimate of F was made.

Relative abundance estimates in the Severn River have indicated that the population of yellow perch has declined slightly due to poor recruitment. Health of the yellow perch stock in river systems like the Severn, with high levels of urbanization within their watershed (>10%), is not well characterized by using fishing mortality rates. This is true not only because many of these rivers are closed to fishing, but also because these systems are characterized by degraded water quality resulting in poor reproductive capacity, egg and larval viability, and recruitment. The Yellow Perch FMP has created a framework under which yellow perch stocks can be assessed more adequately using fishing mortality estimated in conjunction with how yellow perch populations are being impacted by their habitats. Indicators other than fishing mortality rate are being developed that will serve as indices of yellow perch habitat quality. These indicators will help determine habitat management strategies since yellow perch rely upon river and stream health and are impacted by human development.

The upper Bay commercial fishery is managed with a 8.5" – 11" slot limit and a February closure. Target F for the yellow perch commercial fishery is 0.48 and the threshold is 0.66 (2003 Stock Assessment). Fishing mortality rate (F) in the upper Bay has declined since commercial slot limit regulations were enacted. In 1999, estimates of F were approximately 0.8. Estimates of F declined to 0.37 and 0.39 in 2001 and 2002, respectively. The 2003 estimate (0.18) was most likely inaccurate due to ice conditions that prohibited fishing in the late winter. An estimate of F was 0.27 in 2004. Fishing mortality estimates alone indicate that no management action is necessary for 2005 commercial fishery. (2003, 2004 Stock Assessments).

Juvenile Indices and Recruitment

Juvenile indices for the upper Chesapeake Bay are derived from 22 fixed, permanent upper Bay sampling stations as part of the Estuarine Juvenile Finfish Survey. Recruitment in the upper Chesapeake Bay has been highly variable in recent years. Recruitment was high from 1993-96, low during 1997, average from 1998-2001, poor in 2002, and very high in 2003 (2003 Stock Assessment). The 2004 juvenile yellow perch index was significantly lower (0.68) than the 2003 juvenile index (1.34), but was similar to other indices since 1994 (2004 Stock Assessment). MDNR Fisheries Service is currently evaluating a larval survey method to use as a recruitment indicator in tributaries, which would indicate presence or absence of larvae (2003 Stock Assessment).

Population Model Indications

All population models indicate similar population trajectories: increased biomass through 1999, followed by a decline in exploitable biomass during 2000. This decline is attributed to a loss of the 1993 year-class. An update to the model indicated increased abundance during 2001 and 2002 because of the strong 1998 year-class recruiting to the fishery. Population levels will likely increase over the next four years as the strong 1998, 2000, 2001, and 2003 year-classes recruit to the spawning stock. (2003 Stock Assessment).

Fyke Net Bycatch

95% of the yellow perch harvested by commercial fisherman are caught by fyke net. In 2003, a study was designed to evaluate the survival of yellow perch caught and released from fyke nets. No mortality was documented among 168 yellow perch that were used in five 48-hour trials. Observed lack of mortality was consistent with fyke nets used to capture fish for tagging programs and for brood stock procurement in hatchery operations. These data indicate that fyke nets are not inherently destructive, if operated in a conscientious manner. (2003 Stock Assessment)

Impervious Surface as an Indicator of Development

In 2003, a MDNR project was initiated to develop habitat-based reference points for Chesapeake Bay fish species of special concern, including yellow perch. Impervious surface was used as an indicator of development. This project focused on determining how impervious surface affects vital parameters of finfish survival. Parameters shown to reflect level of impervious surface can later be used in spawner biomass per recruit models to develop impervious surface reference points that can be used for finfish stock management.

Historical data analysis indicated some clear associations between impervious cover and finfish habitat. Low dissolved oxygen events increased in frequency with increased impervious surface. Developed river systems, those with 10-20% impervious surface, had lower median dissolved oxygen (<3 mg/L) than less developed systems (4.5-5 mg/L). Dissolved oxygen levels lower than 3 mg/L have been shown to significantly reduce finfish survival (US EPA, 2003). The number of fish kills increased as percent impervious surface increased. The number of species decreased with increasing impervious surface. The study was unable to make a direct link between impervious cover and individual finfish population abundance, because sample sizes were small, watershed sizes varied, and gradient of impervious cover was incomplete. However, this study did indicate that there is a strong potential for development of a model to measure the influence of impervious surface on finfish populations. This would be an important tool to help managers to predict land use effects on fish stocks. (2003 Stock Assessment)

Assessment of Habitat and Population Dynamics in Severn River

The Severn River was one of the river systems closed in 1989 to both recreational and commercial fishing and was selected and identified within the FMP as the focus of the Severn River Ecosystem Study, a 5-year study to assess the effects of degraded habitat on various life history stages of the yellow perch in the Severn system. The interim report of the Severn River Ecosystem Study (MDNR, 2003) indicated that Severn River yellow perch population expansion is limited by poor recruitment within the system.

Severn River recruitment depends entirely on immigration of upper Bay yellow perch and stocking efforts. Immigration is limited by salinity levels at the mouth of the river and high flow rate from the Susquehanna. Egg and larval viability is poor in the Severn, which appears to be a result of degraded water quality and not sedimentation.

Hypoxia and salinity intrusion are problems for the Severn River yellow perch population. Summer 2001-2003 dissolved oxygen levels were poor at all water depths. Salinity levels in spawning and nursery areas were almost always too high to support viable egg production or larval survival.

It is likely that the increase in salinity in this system is attributable to urbanization, resulting in altered stream flow. Stream flow is altered when increased impervious surface directs rainfall to fluvial streams directly, instead of allowing it to seep into groundwater and natural springs. Because fresh rainwater is less dense than saline water, the high volume of storm water enters streams quickly and does not mix well with the existing water. This process leads to high pulses of fast-moving, freshwater and results in higher salinities in streams over time than would occur with lower levels of development. Before the Severn River Study is completed, a spawner biomass per recruit model for yellow perch will be developed that will incorporate habitat effects on stock, a tool that will aid in determining sustainable harvest level strategies for urbanized tributaries.

Fishing Regulations

Two new regulatory options are being discussed for the yellow perch in Maryland waters: The first issue is that in some cases, yellow perch are being held in fyke nets while the fishery is closed in February and then subsequently the fish are landed in March once the fishery has reopened. These practices defeat the purpose of the closed season and regulatory action is being considered to remedy this problem. The second regulatory option that is up for discussion is potential opening of closed areas that have shown marked increase in population size in recent years.

Fishery Statistics

Commercial Landings

Maryland commercial landings of yellow perch for 2002 totaled 170,000 lbs, which was up from 118,000 lbs in 2001. These increasing commercial landings reflect the increased value of yellow perch for Maryland fisherman, as fisheries for the species have been closed in the Midwest and the commercial size limit in Maryland has been imposed to further limit availability. The 2003 commercial landings of yellow perch totaled 54,106 lbs in Maryland. The decrease in harvest from the previous year is most likely due to ice formation in the late winter of 2003, which made fishing difficult. In 2004, commercial landings were very similar to the previous year and totaled 54,814 lbs (Figure 20.1).

Recreational Landings

The Marine Recreational Fisheries Statistics Survey does not collect recreational data for yellow perch and recreational creel surveys are not annually conducted. Recreational catch-and-release mortality of yellow perch was evaluated in 2002. Anglers provided 241 yellow perch that were held for 48 hours to monitor survival. Overall mortality was 2.9% for both legal and sub-legal yellow perch. This data indicates that about 97% of the fish caught and subsequently released by recreational anglers likely

survive and that this component of the recreational fishery is not likely to have a major impact on the stock. (2002 Stock Assessment)

Conclusion

In the areas that are being monitored, fishing mortality does not appear to be having a negative effect on the yellow perch population. There is no fishing mortality on the nine river systems in Maryland that are closed to commercial fishing, six of which are also closed to recreational fishing. Fishing mortality rate does not sufficiently reflect the health of the yellow perch stocks in Maryland tributaries. Habitat degradation has been shown to negatively affect the yellow perch population in the Severn River, and is likely causing problems for populations of this species in other urbanized river systems in Chesapeake Bay. Recruitment in the Severn River is entirely dependent on immigration from the upper Bay stock. Egg and larval viability in the Severn is extremely poor. The Severn River Ecosystem study will, before its completion, develop a spawner biomass per recruit model that will incorporate habitat needs of the yellow perch. This will lead to the development of habitat indices. Managers will have better tools with which to determine management strategies for yellow perch populations in Chesapeake Bay once the habitat indices are developed. Habitat and stock monitoring in the Chesapeake Bay and its tributaries is a necessary component in determining health of yellow perch stocks and will continue to be critical in evaluating both stock and habitat indices used to drive management actions.

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Figure 20.1. Commercial Landings of Yellow Perch from Maryland and Virginia, 1950-2003

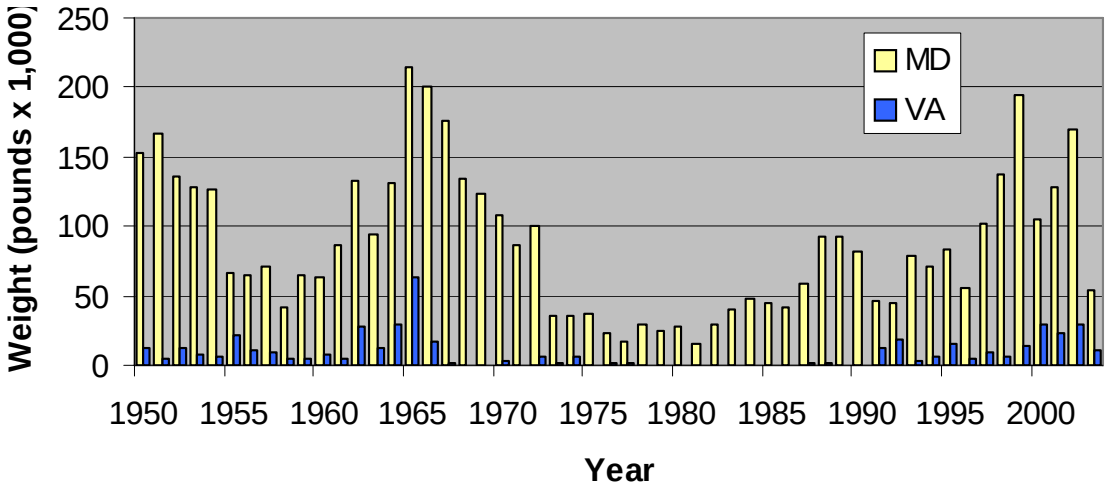

Table 20.1 Maryland Tidewater Yellow Perch Fishery Management Plan (FMP) Implementation (*10/05)*

Section	Action	Date	Comments
Implement Ecosystem Considerations	1) Adopt the following ecosystem guidelines	2001	
	1.1) Participate in forums, which develop federal or state water quality criteria.	Ongoing	Refer to Appendix 1-1 for Chesapeake Bay Program (CBP) efforts.
	1.2) Cooperate with the MD Department of Natural Resource's (DNR) Chesapeake and Coastal Watershed Services in the development of watershed assessment surveys, watershed restoration plans and in the implementation of restoration and enhancement projects	Ongoing	MD Fisheries Service (FS) staff review the Water Resource Assessment Service (WRAS) proposals and participate in assessments.
	1.3) Participate in the review of permits for projects, which have the potential for significant impact on fishery resources.	Ongoing	Coordinate with DNR Environmental Review Unit.
	1.4) Cooperate with the CBP and the Atlantic States Marine Fisheries Commission (ASMFC) to develop models, collect and exchange data, and support research projects that explore multispecies management.	Ongoing	Coordinate with multispecies modeling efforts especially concerning the development of an Ecopath/EcoSim model for the Chesapeake Bay.
	1.5) Develop funding sources for habitat restoration.		MDNR is working with FWS Habitat initiative to seek additional funding.
	1.6) Develop research proposals to examine habitat fish linkages.		Impervious surface/aquatic impacts/fish response project is currently underway. Severn River Ecosystem Study is currently underway

Table 20.1 Maryland Tidewater Yellow Perch Fishery Management Plan (FMP) Implementation (*10/05)*

Section	Action	Date	Comments
	2) Initiate a Severn River Ecosystem study that focuses on life history stage analysis to assess the effects of degraded habitat on stock abundance.	2001 Ongoing	
	3) Use the Yellow Perch FMP as a model for the application of ecosystem-based fishery management principles and develop new methods of application/implementation.	Ongoing	Once the habitat component is completed, more applications will be considered.
Restore Yellow Perch Habitat and Enhance Yellow Perch Populations	4) Use the table on Stock Status and Exploitation and the watershed planning process, to designate yellow perch areas for restoration, maintenance or enhancement and develop specific habitat strategies for each area.		This action needs coordination within DNR and MDE.
	5) Designate the currently closed rivers as yellow perch areas of particular concern, so if resources and funding become available, they can be directed to these areas.	2002	The Magothy, Nanticoke, Patapsco, Severn, South and West Rivers have been designated as yellow perch spawning areas and harvest is prohibited.
	6) Form a MD DNR intra- and inter departmental team to implement habitat restoration strategies for yellow perch in prioritized tributaries of the Bay. Coordinate with the Watershed Restoration Action Plans and evaluate five watersheds annually.	2002 Continue	MD FS is working with Tidewater Ecosystem Assessment (TEA) and WRAS to develop habitat recommendations.

Table 20.1 Maryland Tidewater Yellow Perch Fishery Management Plan (FMP) Implementation (*10/05)*

Section	Action	Date	Comments
	7) Identify essential fish habitat (EFH) for utilizing progressively more detailed information.	On-going	The Magothy, Nanticoke, Patapsco, Severn, South and West Rivers have been designated as yellow perch spawning areas and harvest is prohibited. A spawner biomass per recruit model incorporating habitat needs of yellow perch will be developed to aid in determining the ability of yellow perch habitat to support healthy populations.
	8) Facilitate the implementation of habitat management and restoration practices identified as important to yellow perch.	When appropriate	Work with trib teams and local riverkeepers.
Control Fishing Mortality by establishing biological reference points (BRPs)	9) Adopt BRPs of $F_{35\%}$ and $F_{25\%}$ as a threshold for the yellow perch resource. As more data becomes available, the BRPs may be changed to reflect the most current status of the resource.	2002 Continue	Currently used to determine status of the stocks.
that describe the targets and thresholds (limits) for yellow perch stocks.	10) Adopt the decision rules for managing the yellow perch resource based on the target and threshold mortality rates and utilize the decision rules to make recommendations regarding the yellow perch systems currently under assessment.	2002 Continue	
	11) Utilize Table 1 of MD Yellow Perch FMP to guide the development of management strategies and actions for selected river systems within the MD portion of the Bay.	On-going Evaluated/ Updated Periodically	Management actions may include size limits, creel limits, closed seasons, area closures, and/or gear restrictions.

Table 20.1 Maryland Tidewater Yellow Perch Fishery Management Plan (FMP) Implementation (*10/05)*

Section	Action	Date	Comments
	12) Continue the 8.5 -11inch slot limit for the commercial fishery in all open areas and adjust fishing mortality (F) depending on the most recent stock assessment.	2000 Assessed annually	Slot limit has not changed and is currently in place.
	13) Continue the uniform recreational minimum size limit of 9 inches in all open areas. Adjust size and/or creel limits depending on the most recent stock assessment.	2000 Assessed annually	The 9 inch size limit is still in effect.

Table 20.1 Maryland Tidewater Yellow Perch Fishery Management Plan (FMP) Implementation (*10/05)*

Section	Action	Date	Comments
User Conflicts	14) Establish an ad hoc yellow perch committee comprising stakeholders to provide input into the yellow perch management process.	2001	The ad hoc group will meet as necessary. New recommendations will also be considered by the Sport Fish & Tidal fish advisory committees.
Examine the conflict between commercial and recreational uses of yellow perch. Identify	15) Evaluate the utility of a web-based volunteer angler survey to collect data on the recreational fishery and implement the survey if feasible.	2002	A pilot program to utilize angler logbooks was implemented, but the anglers did not provide any information. The program was discontinued.
any problems and recommend solutions.	16) MD DNR has implemented a system to track the use of pound nets in the Bay. Evaluate the pound net system. For tracking fyke nets and make recommendations for their use.	2003	
	17) If fishing mortality is too high in relation to the adopted targets, strategies to reduce fishing effort will be explored. Topics to be considered include but are not limited to: capping the number of fyke nets per fishermen, the placement of fyke nets in river systems (i.e., total number per river system; distance between nets); daily harvest restrictions; and seasonal quotas.	As necessary	Management strategies will be evaluated when targets have been exceeded.
	18) Evaluate the need for increased enforcement of yellow perch regulations, develop strategies to meet the needs and implement actions accordingly.	To be determined	

Table 20.1 Maryland Tidewater Yellow Perch Fishery Management Plan (FMP) Implementation (*10/05)*

Section	Action	Date	Comments
Stock Status MD DNR will monitor yellow perch stocks in representative areas of the	19) Continue to sample commercial and recreational harvest of yellow perch and collect basic biological data. Additional biological data may indicate changes in the status of the stocks and require additional management measures.	On-going	FS Multispecies Project collects yellow perch data from commercial and experimental fyke nets, seine and trawl surveys and uses data to develop an annual stock assessment.
Chesapeake Bay in order to assess yellow perch stock status. Assessment and	20) Develop a method for evaluating yellow perch recruitment and utilize it as one of the parameters for assessing stock status and consequent management actions.	2003	Yellow perch recruitment is monitored on the Severn River and in the upper Bay. Larval survey methods are being evaluated for use in tributaries.
Stock Status, cont. additional management efforts will be focused on areas already under special management measures, i.e., closed areas.	21) Yellow perch egg strands are easy to collect and important for hatchery and/or aquaculture endeavors. Maryland will prohibit the removal or selling of egg chains that have been stripped by artificial methods, unless a scientific collection permit has been issued.	2001	Scientific Collection Permit as described in Natural Resources Article, §08-02.12.02, of the Annotated Code of Maryland.. In addition, new regulations have been proposed.
	22) Evaluate additional fishery-independent indicators of stock status, such as the trawl survey in the upper Bay.		Implementation of this action is dependent on manpower and funding
	23) Review and evaluate yellow perch monitoring efforts biannually. Recommend changes in monitoring and protocol necessary to implement the yellow perch FMP.	2002 and even years thereafter	